

Teacher's Guide

Objective and Background of the "Just Add Water" Classroom Science Kits:

This kit is intended to be an easy-to-use way to teach students about water and the importance of water in their lives, while providing the student with an enjoyable learning experience.

You can use the curriculum two different ways:

1. As an interactive computer teaching tool

Students can view the curriculum on a computer, much in the same way that one would view an Internet website.

2. If you prefer, the entire curriculum can be printed out and photocopied. Adobe Acrobat (available free over the Internet) is required to print out this curriculum.

The curriculum is not divided into specific units but may be customized to fit your teaching schedule.

What is included in the kit?

In each kit, you will find the following:

Hach Water Quality Test Strips — Water Quality test strips are the ideal way for students to learn about water quality without complicated procedures or extensive equipment. They are effective, inexpensive, easy-to-use, and safe. Just dip the strip into water, watch for the color development and compare to the color chart on the side of the bottle.

Curriculum on Diskette — The kit includes a curriculum on a 3.5" diskette. This diskette is readable by either MAC (Apple) or PC formats using any web browser, such as Netscape Navigator™ or Microsoft Internet Explorer™. If you do not have a web browser, contact your computer system administrator who probably can install a copy for you. Web browsers are readily available for free over the Internet, or can be purchased from most computer software stores.

TestYES!™ Positive Result Chemistry — In many cases, water testing for specific water quality parameters yields a "negative result", meaning nothing happens. While this may be good in "real life", it's not so fun if you (and your students) want something to happen! For this reason, we have included *TestYES!™*, Positive Result Chemistry, which will guarantee that your test strip will give a positive response.

Pre-paid Response Card — Return this card to get more information about Hach and our products.

How many students can use the kit?

Each kit contains enough test strips to complete 50 tests of each water quality test. If you like, each student can get their own test strip, or you can break the class into small groups, thereby serving more students.

How do I get more test strips or *TestYES!™* Positive Result Chemistry?

The test strips and *TestYES!™* Positive Result Chemistry and Hach Test Strips are easily replaceable by calling leading science education distributors or Hach Company.

Teacher's Guide, continued

Tell me about the *TestYES!*TM Positive Result Chemistry

What is it?

The chemistry is a specially formulated blend of chemistries that will guarantee that your students will get a positive result when the test strip is dipped in water. This will add interest and excitement to the students' learning experience.

How do I use it?

Add one PermaChemTM foil "powder pillow" to about a quart (or about one liter) of water. Distilled or deionized water is ideal, but regular tap water may be used.

Please note: because chlorine is unstable, it will dissipate over time. However, the mixed *TestYES!*TM solution will give a positive result for at least three hours after mixing.

Safety

Is it safe?

Safety was key to the development of this kit. However, any chemical can be harmful if not handled properly. Please read the following precautions carefully:

*TestYES!*TM Positive Result Chemistry

In Powder Form:

In powder form, the *TestYES!*TM positive result chemistry is an oxidizer and may cause eye, skin, and respiratory tract irritation. It should be used only under adult supervision.

In case of contact with eyes or skin — Flush your eyes or skin with water for 15 minutes.

In case of ingestion — Give large quantities of water and call a physician.

In case of inhalation — Remove to fresh air

When mixed with water:

When mixed with water, the *TestYES!*TM Positive Result Chemistry becomes relatively benign. The only effect anticipated is some slight eye irritation if it comes in contact with eyes. Do not ingest the mixed solution.

Note: It is always wise to wear safety goggles when handling any chemicals.

How do I dispose of excess waste?

Dispose of the mixed *TestYES!*TM chemistry by pouring it down the drain while running the tap. Throw the test strips in the trash.

Who is Hach Company?

A brief history of our company...

An enterprising husband and wife team, Clifford and Kathryn Hach, started Hach Chemical Company in 1947, in Ames, Iowa, USA. Originally a producer of known samples for analytical testing in college classrooms, the company began to grow after developing a simplified titration method for measuring hardness in drinking water.

Teacher's Guide, continued

Over time, Hach Chemical Company focused on supplying products and chemicals needed for water quality analysis. Clifford Hach and his team of researchers developed methods for testing everything from acidity to zinc. Electronic analytical instruments, such as colorimeters and turbidimeters, were developed in the 1950s to "bring analytical chemistry out of the laboratory and put it in the workplace and into the hands of the general public."

In 1980, the company name was changed to "Hach Company" to reflect Hach's place as a supplier of laboratory and process instruments, portable laboratories, and test kits, as well as analytical chemicals.

Today Hach Company has facilities in Ames, Iowa, and in Loveland, Colorado, USA. The Loveland facility houses corporate headquarters, research and development laboratories and instrument manufacturing operations. A plastics division and technical training center are also located in Loveland. About 540 employees work in Loveland.

The Iowa facility continues to manufacture and package chemical reagents, and assemble test kits. Sophisticated electronic information systems enable employees to pick, pack, and ship hundreds of orders throughout the world every day.

Today Hach Company is an international presence in the water quality market with offices and representatives around the world. Increasing involvement in the education market is bringing Hach "back to our roots" in science education.

Teachers Guide - Answer Sheet and Teaching Suggestions

PONDS AND STREAMS, Level 1

ACTIVITY 1 - Making Big Words Out of Small Ones

- ANSWERS: sidewalk, thunderstorm, snowball, downstream, upstream, waterfall, groundwater

ACTIVITY 2 - Identify Surface Water

- ANSWERS: All answers are types of surface water, with the exception of winter

ACTIVITY 3 - States of Water

- ANSWERS: "Solid" connects to picture on bottom right; "Liquid" connects to picture on top right; "Vapor" connects to center photo.

ACTIVITY 4 - Water Cycle

- ANSWERS: transpiring, precipitating, condensing
transpire, precipitate, condense

ACTIVITY 5 - Fill in the Blanks

- ANSWERS: 1. evaporation 2. transpiration 3. condenses, precipitation 4. runoff

ACTIVITY 6 - Your Watershed (Self Explanatory)

ACTIVITY 7 - Using Surface Water (Self Explanatory)

ACTIVITY 8 - Healthy or Polluted? (Self Explanatory)

ACTIVITY 9 - NPS

Water Pollution								
Point Source	Nonpoint Source							
	Urban		Rural				Atmospheric	Natural
	Runoff	Construction	Agriculture	Construction	Mining	Forestry	Septic Systems	

ACTIVITY 10 - Categories of NPS

- ANSWERS: Sources of Pollution: B;A;C;D
Causes of Pollution: A;B;D;C

ACTIVITY 11 - Vocabulary Crossword Puzzle

- ANSWERS:
ACROSS: 1) runoff 2) clouds 5) oceans 6) solid 9) evaporation 10) rain 11) lakes
DOWN: 1) rivers 3) liquid 4) snow 6) stream 7) water 8) vapor

ACTIVITY 12 - Senses

- EXAMPLES: Taste: Sweet, Stale; Salty; Metallic; Bitter; Dirty
Smell: Clean; Fresh; Dirty; Chlorine; Salty
Look: Clean; Dirty; Cloudy; Pure; Clear
Feel: Slick, Slimy, Smooth; Cold; Hot
Sound: Quiet, Noisy, "Drip-drop", Rushing; Babbling
Plus many others! 😊

ACTIVITY 13 - Cryptogram

■ ANSWER: We can test water to learn if it's healthy.

ACTIVITY 14 - Water Ions (Class Activity) -

Note: This activity will challenge the students and requires significant teacher involvement.

ACTIVITY 15 - Writing (Self Explanatory)

ACTIVITY 16 - Acid Rain

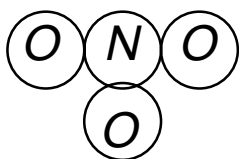
Note: This activity can be implemented with an classroom discussion and/or open writing assignment.

ACTIVITY 17 - Controlling Pollution

■ ANSWER: Ways to Stop NPS pollution
Ride your bike; Turn off lights when not in use; Turn down your thermostat; Ride the bus or other public transportation; Recycle instead of throwing things away.....

ACTIVITY 18 - Nitrates

Chemical Structure of Nitrate - This concept may be a bit challenging for this age.....



WATER TESTING RESULTS LOG SHEET

■ ANSWERS:
1a. pH less than 7 is acidic; pH more than 7 is basic; pH at 7 is neutral
1b. If water has pH < 7, water has more hydrogen ions, > 7 more hydroxide ions
2. Use guide in question 1

ACTIVITY 19 - Testing Additional Solutions for pH

■ ANSWERS:
1. pH of distilled water should be about pH 7.
2. pH of vinegar solution should be acid
3. pH of baking soda should be basic/alkaline
4. pH of tap water varies; should be about pH 5-8
5. Solution with highest pH: baking soda
6. Solution with lowest pH: vinegar solution

ACTIVITY 20 - Acids and Plants Activity

This experiment takes several days, but allows students to see first hand the effects of pH (acids) on plant growth. It can help the student understand the actual effects of acid rain..

ACTIVITY 21 - Phosphate Test

This experiment can experience extremely variable results depending on the fertilizer source. Be sure to try this prior to teaching in class—If phosphate results are beyond the range of the test strips (too high), you can dilute the fertilizer solution with water. This experiment or process can help students realize the (small) size of a milligram per liter or ppm.

ACTIVITY 21 - Nitrate Test

This experiment can experience extremely variable results depending on the fertilizer source. Be sure to try this prior to teaching in class—If nitrate results are beyond the range of the test strips (too high), you can dilute the fertilizer solution with water. This experiment or process can help students realize the (small) size of a milligram per liter or ppm.